REMARKS

Claims 1 – 136 are pending in the application. Claims 1, 27, 53, 54 and 110 are independent claims. Claims 27-38, 44-46 and 48-52 stand rejected under 35 U.S.C. § 102. Claims 1-6, 7, 8-12, 13-15, 16, 17, 18, 20, 21, 22-24, 25, 26, 27-38, 39-41, 42, 43, 44-46, 47, 48-52, 53-54, 55, 56, 57, 58-60, 61, 62-64, 65, 66-70, 71-73, 74, 75, 76-77, 78, 79-81, 82, 83-86, 87, 88-90, 91, 92-96, 97-99, 100, 101, 102-103, 104, 105-107, 108, 109-113, 114, 115-117, 118, 119-123, 124-126, 127, 128, 129-130, 131, 132-134, 135, 136 stand rejected under 35 U.S.C. § 103. Claims 4 and 5 have been objected to.

All rejections are respectively traversed.

Claims 1 and 4 have been amended for reasons unrelated to patentability.

Claim Objections

Claim 4 has been objected to because it did not match the original claim as filed. Claim 4 has been amended to overcome this typographical error.

Claim 5 has been objected to because it depends upon a subsequent claim. Applicants believe this claim is in proper form as it stands and does not require amending to overcome the objection which is traversed.

Reconsideration and withdrawal of the objections is respectfully requested.

Rejections Under § 102

Claims 27-38, 44-46 and 48-52 were rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent 6,266,658 to Adya et al.

The claimed invention recites a method for evaluating a plurality of candidate index sets for a workload of database statements in a database system. An index superset is formed from a union of a current index set and a proposed index set. The current index set is a set of indexes that have been created for the database. The proposed index set may be proposed by specialized tools, such as Oracle Expert, or a user, such as an experienced database administrator. One or more candidate index sets are derived from this superset. Statistics are generated based on the candidate index sets and presented to, e.g., a user or an index tuning mechanism. By starting

with a limited superset of indexes, the claimed invention is able to focus the index verification process from early on, and save a significant amount of time and resources to reach an appropriate solution.

The only independent claim 27 recites in relevant part:

27. A system for evaluating a plurality of candidate index sets for a workload in a database system, the workload derived from a plurality of statements, the system comprising:

a workload evaluator which evaluates each statement within the workload using collected database statistics;

an index solution evaluator which, responsive to the workload evaluator, evaluates each index in a candidate index set with respect to the workload, the candidate index solution being one of the plurality of candidate index sets, each *candidate index set derived from an index superset formed by the union of a current index set and a proposed index set;...*

The Applicants' respectfully submit that Adya does not teach or suggest the Applicants' claimed "*candidate index set derived from an index superset formed by the union of a current index set and a proposed index set.*"

In comparison, Adya describes a technique for identifying database indexes given a workload for the database. See col. 3, ll. 23-26. According to the technique, a workload containing the most common queries to the database is parsed to identify candidate indexes that could useful to satisfy the queries. See col. 6, ll. 61-64. The candidate indexes may be further reduced by applying various restrictions. These restrictions may include selecting only single column indexes, covering indexes and foreign key indexes to be candidate indexes that comprise a set of candidate indexes. See col. 7, ll. 38-39, col. 8, ll. 1-32, col. 8, ll. 40-65 and Fig. 5. A plan of execution is derived from the queries and candidate indexes in the set of candidate indexes. This plan contains index usage information that identifies which indexes are used to answer each query. See col. 6, line 55 to col. 7, line 11.

The indexes are further evaluated on the basis of the cost of the plan and the indexes with the most potential for improvement of the cost are selected. See col. 7, ll. 12-20. The selected indexes are further evaluated to ensure that the total workload cost never increases with low benefit. See col. 7, ll. 22-27, col. 9, ll. 2-21. The outcome of this evaluation is a final set of indexes which may be used by a user to create new indexes and modify the set of indexes for use on the database to enhance performance. See col. 7, ll. 30-33.

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In summary, Adya discusses forming a candidate index set by parsing queries associated with a workload to identify a set of potential indexes. The set of potential indexes may be further reduced by only considering indexes that are single column indexes, covering indexes and foreign key indexes as candidate indexes.

In contrast to Adya, the Applicants claim deriving a candidate index set from a superset that is formed by the union of a current index set and a proposed index set. As noted above, the current index set is a set of indexes that have been created for the database and the proposed index set may be proposed by specialized tools, such as Oracle Expert, or a user, such as an experienced database administrator. Nowhere does Adya teach or suggest deriving a candidate index set from a superset formed by a union of a set of indexes that have been created for a database and a proposed set of indexes as claimed by the Applicants.

Because of the absence of the Applicants' claimed "*candidate index set derived from an index superset formed by the union of a current index set and a proposed index set*" in Adya, Adya is legally precluded from rendering claims 27-38, 44-46 and 48-52 anticipated under 35 U.S.C. § 102. Therefore, Applicants believe claims 27-38, 44-46 and 48-52 are in condition for allowance.

Reconsideration and withdrawal of the rejection is respectfully requested.

Rejection Under § 103

Similar to claim 27, claim 1 recites in relevant part:

1.   A method for evaluating a plurality of candidate index sets for a workload of database statements in a database system, the method comprising:
        forming an index superset from a union of a current index set and a proposed index set;...

As discussed above, Adya does not teach or suggest an index superset formed from a union of a current index set and a proposed index set.

Chaudhuri (I) and Chaudhuri (II) taken either singly or in combination also do not teach or suggest the Applicants' claimed "*forming an index superset from a union of a current index set and a proposed index set.*"

Claims 1-6, 8-12, 16, 18, 20, 22-24, 26, 53, 54, 56, 58-60, 62-64, 66-70, 74, 76, 77, 79-81, 83-86, 88-90, 92-96, 100, 102, 103, 105-107, 109-113, 115-117, 119-123, 127, 129, 130,

132-134 and 136 have been rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent 5,960,423 to Chaudhuri et al. ("Chaudhuri (I)") in view of U.S. Patent 6,223,171 to Chaudhuri et al. ("Chaudhuri (II)").

Claims 7, 65, 91 and 118 have been rejected under 35 U.S.C. § 103 as being unpatentable over Chaudhuri (I) and Chaudhuri (II) in further view of U.S. Patent 5,924,088 to Jakobsson et al. ("Jakobsson").

Claims 13-15, 71-73, 97-99 and 124-126 have been rejected under 35 U.S.C. § 103 as being unpatentable over Chaudhuri (I) and Chaudhuri (II) in further view of U.S. Patent 6,003,022 to Eberhard et al. ("Eberhard").

Claims 39-41 have been rejected under 35 U.S.C. § 103 as being unpatentable over Adya in further view of Eberhard.

Claim 43 has been rejected under 35 U.S.C. § 103 as being unpatentable over Adya in further view of Smith.

Claims 17, 75, 101 and 128 have been rejected under 35 U.S.C. § 103 as being unpatentable over Chaudhuri (I) and Chaudhuri (II) in further view of U.S. Patent 5,404,510 to Smith et al. ("Smith").

Claims 21, 78, 104 and 131 have been rejected under 35 U.S.C. § 103 as being unpatentable over Chaudhuri (I) and Chaudhuri (II) in further view of U.S. Patent 6,021,405 to Celis et al. ("Celis").

Claim 47 has been rejected under 35 U.S.C. § 103 as being unpatentable over Adya in further view of Celis.

Claims 25, 82, 108 and 135 have been rejected under 35 U.S.C. § 103 as being unpatentable over Chaudhuri (I) and Chaudhuri (II) in further view of Adya.

Claims 55, 61, 87 and 114 have been rejected under 35 U.S.C. § 103 as being unpatentable over Chaudhuri (I) and Chaudhuri (II) in further view of Gurry et al., "Oracle Performance Tuning" ("Gurry").

Claim 57 has been rejected under 35 U.S.C. § 103 as being unpatentable over Adya in further view of Gurry.

Claim 42 has been rejected under 35 U.S.C. § 103 as being unpatentable over Adya in further view of Finkelstein et al., "Physical Database Design for Relational Database" ("Finkelstein").

Chaudhuri (I) discusses a technique for determining a set of candidate indexes for a workload of queries that are to be executed against a database. See col. 2, ll. 13-14. According to the technique, index configurations are selected based on a relative effectiveness among candidate index configurations for the database. The effectiveness of a particular index configuration is based on cost estimates to execute queries of the workload against the database using the particular index configuration. See col. 6, ll. 39-45.

A total cost of an index configuration is determined as a sum of cost estimates to execute each query of the workload against the database using the particular index configuration. The candidate index configuration having the least total cost is considered to be the most effective in minimizing the cost of executing the workload against the database. See col. 6, ll. 46-54.

Chaudhuri (I) also discusses using what-if indexes to simulate the presence of indexes absent from the database. See col. 7, ll. 11-15. These what-if indexes are used to evaluate candidate index configurations. See col. 8, ll. 28-41.

Chaudhuri (II) describes a what-if analysis technique that may be used to perform quantitative analysis of a database system. See col. 1, ll. 64-65. According to the technique, a hypothetical configuration is defined for the database system. The hypothetical configuration contains a hypothetical set of indexes and is of a hypothetical size. See col. 2, ll. 21-24, col. 13, ll. 24-26 and Fig. 5. The hypothetical configuration is simulated and the costs of workload queries are estimated with respect to the hypothetical configuration. See col. 2, ll. 26-44, col. 14 ll. 23-24 and Fig. 5. The evaluation continues until all queries for the workload have been evaluated. See col. 15, ll. 18-23 and Fig. 5. After all queries for the workload have been evaluated, an estimated cost for the workload is determined from the estimated costs of all the queries. See col. 15, ll. 53-57 and Fig. 5.

Although Chaudhuri (I) and Chaudhuri (II) may use what-if indexes and actual indexes to evaluate candidate index configurations, both Chaudhuri (I) and Chaudhuri (II) fall short of teaching or suggesting forming an index superset from a union of these indexes. Therefore both

Chaudhuri (I) and Chaudhuri (II) fail to teach or suggest forming an index superset from a union of a current index set and a proposed index set, as claimed by the Applicants.

Examiner notes that the storage of indexes serves as an index superset. The Applicants respectfully disagree. The superset claimed by the Applicants is formed by a union of the current index set and the proposed index set. Merely storing indexes does not constitute forming a set from a union of two sets. As is well-known in the art a union of two sets A and B is a set of all elements in A or B. Thus, as claimed by the Applicants, the superset is a set of all elements in the current index set or the proposed set. This is very different that just storing two sets. For example if a first set C contains the elements {1, 2, 3} and a set D contains the elements {3, 4, 5} simply storing the elements of set C and D in a single set may yield a result of {1, 2, 3, 3, 4, 5} which is not a union of sets C and D.

Because of the absence of the Applicants' claimed *"forming an index superset from a union of a current index set and a proposed index set"* in Chaudhuri (I) and Chaudhuri (II), These references are legally precluded from rendering claims 1-6, 8-12, 16, 18, 20, 22-24, 26, 53, 54, 56, 58-60, 62-64, 66-70, 74, 76, 77, 79-81, 83-86, 88-90, 92-96, 100, 102, 103, 105-107, 109-113, 115-117, 119-123, 127, 129, 130, 132-134 and 136 unpatentable under 35 U.S.C. § 103 over Chaudhuri (I) in view of Chaudhuri (II). Therefore claims 1-6, 8-12, 16, 18, 20, 22-24, 26, 53, 54, 56, 58-60, 62-64, 66-70, 74, 76, 77, 79-81, 83-86, 88-90, 92-96, 100, 102, 103, 105-107, 109-113, 115-117, 119-123, 127, 129, 130, 132-134 and 136 are in condition for allowance.

Chaudhuri (I) and Chaudhuri (II) taken in combination with Jakobsson do not teach or suggest the Applicants' claimed index superset formed from a union of a current index set and a proposed index set and therefore claims 7, 65, 91 and 118 are in condition for allowance.

Chaudhuri (I) and Chaudhuri (II) taken in combination with Eberhard do not teach or suggest the Applicants' claimed index superset formed from a union of a current index set and a proposed index set and therefore claims 13-15, 71-73, 97-99 and 124-126 are in condition for allowance.

Adya taken in combination with Eberhard do not teach or suggest the Applicants' claimed index superset formed from a union of a current index set and a proposed index set and therefore claims 39-41 are in condition for allowance.

Chaudhuri (I) and Chaudhuri (II) taken in combination with Smith do not teach or suggest the Applicants' claimed index superset formed from a union of a current index set and a proposed index set and therefore claims 17, 75, 101 and 128 are in condition for allowance.

Adya taken in combination with Smith do not teach or suggest the Applicants' claimed index superset formed from a union of a current index set and a proposed index set and therefore claim 43 is in condition for allowance.

Chaudhuri (I) and Chaudhuri (II) taken in combination with Celis do not teach or suggest the Applicants' claimed index superset formed from a union of a current index set and a proposed index set and therefore claims 21, 78, 104 and 131 are in condition for allowance.

Adya taken in combination with Celis do not teach or suggest the Applicants' claimed index superset formed from a union of a current index set and a proposed index set and therefore claim 47 is in condition for allowance.

Chaudhuri (I) and Chaudhuri (II) taken in combination with Adya teach or suggest the Applicants' claimed index superset formed from a union of a current index set and a proposed index set and therefore claims 25, 82, 108 and 135 are in condition for allowance.

Chaudhuri (I) and Chaudhuri (II) taken in combination with Gurry teach or suggest the Applicants' claimed index superset formed from a union of a current index set and a proposed index set and therefore claims 55, 61, 87 and 114 are in condition for allowance.

Adya taken in combination with Gurry do not teach or suggest the Applicants' claimed index superset formed from a union of a current index set and a proposed index set and therefore claim 57 is in condition for allowance.

Adya taken in combination with Finkelstein do not teach or suggest the Applicants' claimed index superset formed from a union of a current index set and a proposed index set and therefore claim 42 is in condition for allowance.

All independent claims are in condition for allowance.

All dependent claims are dependent on allowable independent claims and therefore in condition for allowance.
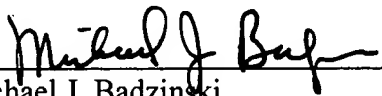
Reconsideration and withdrawal of the rejections user § 103 are respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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